

WHAT IS CLAIMED IS:

1. A method for echo and noise control in a communication device,
comprising:
5 receiving a signal at an input to the communication device;
determining background noise in the signal; and
adaptively determining an order of noise suppression and echo
cancellation based on the background noise in the signal.
- 10 2. The method according to claim 1, wherein the step of adaptively
determining the order of noise suppression and echo cancellation further comprises:
comparing the background noise to at least one threshold;
performing echo cancellation prior to noise suppression on the signal if
the background noise is below the at least one threshold; and
15 performing noise suppression prior to echo cancellation on the signal if
the background noise is above the at least one threshold.
- 20 3. The method according to claim 2, wherein the background noise is
based on an estimated noise level when there is no desired input received at the input
of the communication device.
- 25 4. The method according to claim 2, wherein the step of adaptively
determining the order of noise suppression and echo cancellation further comprises:
performing echo cancellation prior to noise suppression on the signal if
the background noise is below a first threshold of the at least one threshold; and
performing noise suppression prior to echo cancellation on the signal if
the background noise is above a second threshold of the at least one threshold.
- 30 5. The method according to claim 4, wherein the second threshold is
determined based on a noise threshold when benefits of suppressing the
environmental noise outweigh detriments of the nonlinear effect of noise suppression
on echo cancellation.

6. The method according to claim 4, wherein the first threshold is determined based on a noise threshold when detriments of the nonlinear effect of noise suppression on echo cancellation outweigh benefits of noise suppressing the environmental noise.

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7. The method according to claim 4, wherein the second threshold is greater than the first threshold.

8. The method according to claim 1, further comprising setting an indicator to indicate a current order of echo cancellation and noise suppression.

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9. An electronic device, comprising:
an audio input configured to receive a received signal;
an audio output configured to output an output signal;
a transceiver configured to transmit a transmitted signal; and
an adaptive echo and noise control system coupled to the audio input, the audio output, and the transceiver, the adaptive echo and noise control system including

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an echo canceller; and
a noise suppressor,
wherein the adaptive echo and noise control system is configured to adaptively determine an order of echo cancellation and noise suppression based on an amount of noise in the received signal to generate a desired signal, and
wherein the adaptive echo and noise control system is further configured to send the desired signal to the transceiver.

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10. The electronic device according to claim 9, wherein the echo canceller comprises:

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an adaptive filter
a least mean square adaption control and doubletalk detector; and
a cancellation point.

11. The electronic device according to claim 9, wherein the noise suppressor comprises:

- a frequency domain converter,
- a noise estimator and adaptive noise suppression controller,
- 5 a multi-channel noise suppression point; and
- a time domain converter.

12. The electronic device according to claim 9, wherein the adaptive echo and noise control system is further configured to adaptively determine the order of noise suppression and echo cancellation by

- comparing the background noise to at least one threshold,
- performing echo cancellation prior to noise suppression on the signal if the background noise is below the at least one threshold, and
- performing noise suppression prior to echo cancellation on the signal if
- 15 the background noise is above the at least one threshold.

13. The electronic device according to claim 12, wherein the adaptive echo and noise control system is further configured to adaptively determine the order of noise suppression and echo cancellation by

- 20 performing echo cancellation prior to noise suppression on the signal if the background noise is below a first threshold of the at least one threshold, and
- performing noise suppression prior to echo cancellation on the signal if the background noise is above a second threshold of the at least one threshold.

14. The electronic device according to claim 13, wherein the second threshold is determined based on a noise threshold when benefits of suppressing the environmental noise outweigh detriments of the nonlinear effect of noise suppression on echo cancellation.

15. The electronic device according to claim 13, wherein the first threshold is determined based on a noise threshold when detriments of the nonlinear effect of noise suppression on echo cancellation outweigh benefits of noise suppressing the environmental noise.

16. The electronic device according to claim 13, wherein the second threshold is greater than the first threshold.

5 17. The electronic device according to claim 9, wherein the adaptive echo and noise control system is further configured to set an indicator to indicate a current order of echo cancellation and noise suppression.

10 18. The electronic device according to claim 9, wherein the amount of noise is based on an estimated noise level when there is no desired input received at the audio input of the electronic device.

15 19. A method for echo cancellation and noise suppression in a mobile communication device, comprising:
receiving an acoustic signal at an input to the mobile communication device, the acoustic signal including a speech component, an echo component, and a noise component;
obtaining the noise component in the acoustic signal;
comparing the noise component to at least one threshold;
20 configuring the order of echo cancellation and noise suppression to perform echo cancellation prior to noise suppression on the acoustic signal if the noise component is below the at least one threshold to obtain a desired signal;
configuring the order of echo cancellation and noise suppression to perform noise suppression prior to echo cancellation on the acoustic signal if the noise
25 component is above the at least one threshold to obtain a desired signal; and
transmitting the desired signal.

20. The method according to claim 19, further comprising setting an indicator to indicate a current order of echo cancellation and noise suppression.